Asia-Pacific Network for Sustainable Forest Management

and Rehabilitation

PROJECT MID-TERM EVALUATION REPORT

Integrated Forest Ecosystem Management Planning and Demonstration Project in Greater Mekong Sub-region

(Myanmar site)

Prepared by Professor San Win

December 2023

Contents

Acronyms and abbreviations *4*

Executive Summary *5*

1 INTRODUCTION *8*

1.1 Project brief 8

1.2 Evaluation objectives 8

1.3 Evaluation scope and criteria 8

2 EVALUATION METHODS AND APPROACHES *9*

3 KEY FINDINGS AND ANALYSIS *9*

3.1 Project Relevance and Coherence 9

3.1.1 Contribution to target region 9

3.1.2 Contribution to APFNet priorities 10

3.2 Project coherence 10

3.3 Performance of project implementation 11

3.3.1 Output 1 “Construction Plan of FRI Arboretum” formulated 11

3.3.2 Output 2 Forest germplasm resources introduction and breeding nursery constructed 12

3.3.3 Output 3 9 ha native forest ecological conservation zone established 14

3.3.4 Output 4 16 ha thematic gardens (Plantation and exhibition zone) 15

3.3.5 Output 5 Accessory facilities for arboretum constructed 20

3.3.6 Output 6 Integrated watershed management plan formulated 22

3.3.7 Output 7 Demonstration of integrated watershed management practices established 23

3.3.8 Output 8 An integrated forest management technology assembled and a technical handbook formulated 28

3.3.9 Output 9 Training courses for project stakeholders 28

3.3.10 Output 10 International exchange on sustainable forest management conducted 29

4 Project achievements *29*

5 Performance of project management *29*

5.1 Project communication and dissemination 29

5.2 Project management and implementation team 30

5.3 Monitoring, evaluation and reporting 31

5.4 Project consultancy 31

5.5 Project financial management 31

6 Project Impacts and Sustainability 31

6.1 Project benefits 31

6.2 Issues, challenges and lessons learnt 32

6.3 Project Sustainability and duplicability 32

7 CONCLUSIONS 32

8 RECOMMENDATIONS 35

Annexes 37

Acronyms and abbreviations

APFNet	Asia-Pacific Network for Sustainable Forest Management and Rehabilitation
DG	Director General
EA	Executing Agency
FD	Forest Department of Myanmar
FRI	Forest Research Institute of Myanmar
MTE	Mid-Term Evaluation
MIWRM	Myanmar Integrated Water Resource Management
NPT	Nay Pyi Taw (the capital of Myanmar)
PIU	Project Implementation Unit (Organized at FRI)
PMC	Projects Monitoring Committee (Located at FD, HQ)
PMT	Project Management Team (Organized at FRI)
PSC	Project Steering Committee (Organized at FD, HQ)

Executive Summary

The "Integrated Forest Ecosystem Management Planning and Demonstration Project in Greater Mekong Sub-region (Myanmar site) [2018P4-MYR]" was implemented by the Myanmar Forest Research Institute (FRI) since January 2020. The objectives of this project are to conserve forest germplasm resources, rehabilitate forest ecological services and forest productivity through establishment of arboretum in FRI and implementation of integrated watershed forest management in Palaung watershed area, Southern Shan State in Myanmar, so that to contribute to sustainable forest management in the Greater Mekong Sub-region.

To assess progress, identify problems and challenges for this project propose corrective actions, and give recommendations to the remaining project activities to ensure the achievement of project goal and objectives, a Mid Term Evaluation (MTE) was conducted during 6-10 November 2023 through desk review of project related documents, making Focus Group Discussion (FGD) and face-to-face interview with project stakeholders responsible persons as well as on-site measurement of tree growth data. Both quantitative and qualitative analysis methods were employed for this purpose.

Key findings and analysis

The project is running on track with about 80 percent of the expected outputs delivered after four years of implementation. On one hand, under the circumstance of pandemic of COVID 19, the construction of arboretum is going on smoothly, the breeding nursery/greenhouse was upgraded and put into operation. 9ha native forest ecological conservation zone was well established and under regular maintenance. 16ha thematic gardens (plantation and exhibition zone) was completed on 80% basis except for the wetland zone was fully completed. It's found that survival rate of the bamboo planted is not satisfactory because that they are climatic, soil and elevation specific in biological feature. The accessory facilities for arboretum are almost completed with the tree identification system half done. On the other hand, an integrated watershed management plan was formulated through participatory approach and demonstration activities are carried out on the ground through inter planting timber trees with fruit trees with bamboo planted along the boundary of the demo sites. It was observed that now 80% of the demo sites are completed and timber trees and fruit trees are thriving well, but some bamboo planted at lower land are submerged due to the rise of water level in Palaung watershed this year. Additionally, trainings for young researchers, local officials and farmers on integrated forest management technology and rehabilitation of degraded forest were conducted on 80% basis, and a handbook summarizing the best practices of this project is under preparation. It's expected that the remaining project activities can be accomplished before the end of this project.

Project Management

·Regarding project fund use, a little more than half of the proposed project fund has been used until now. The EA's financial records are examined by an auditing and accounting firm and are verified that the financial uses against project activities are effective. It is reported by

the firm that the Project's accounts and schedules are established in accordance with the provisions of Myanmar Companies Act and generally accepted accounting standards.

·Project staff are working under the good guidance of the project director, and the project activities are on its right track and **the expected outputs are achievable at the end of the project period.**

Main problems and challenges encountered during the project implementation and corresponding counter measures

·T**he project is too ambitious to include some species which grow well only in a specific region**. As a result, some species which prefer lower temperature and/or heavy rainfall or high elevation are wilting now. An example is some Wabo (*Dendrocalamus brandisii*) bamboo species which prefers heavy rain falls. The species seems to be unhealthy in the present planting site. **To replace site specific plants with the plants/bamboos which can grow well in the present project sites is required in the remaining project implementing periods.**

·**The villagers have some concern over land ownership for their land**. The villagers' paddy field and orchards were now submerged for construction of Paung Laung dam, and they were moved by the government to present location. The villagers want to register their present farming areas to secure their land ownership.

·**The EA of this project has faced some challenges caused by pandemic disease, social changes during its implementation period which caused some activities had to be shifted or altered in terms of time and activities.** It is found that the Project Steering Committee (PSC) chaired by the Director General (DG) of Forest Department (FD) of Myanmar resolved the challenges, especially travel restriction, through using media during the pandemic period. The project staff established a connection network among the staff and community mobilizers of Leinli village to implement the project activities during the pandemic period when travelling was strictly restricted.

Recommendations for remaining project activities

·Construction of arboretum is good, but it needs special attention, regular and stable electricity and water supply for long term existence of the arboretum facilities, like the greenhouse and nursery facilities for semi-temperate climate preferred-species. Similarly, replanting in the places of dead plants, bamboo zone in particular, should be done with appropriate species. Plants newly introduced to these thematic zones should be watched carefully.

·Permission for collecting entrance fees should be asked to the DG of the FD for ornamental, medicinal, rare and endangered tree planting zones.

·Regular follow up activities, like pruning, thinning, and fire protection to watershed management demonstration plantations should also be done to achieve the expected results of soil conservation for the Paung Laung.

·The EA of this project, in consultation with local government officers, local land use department in particular, should assist in **land registration** for the villagers as they have cultivated their land with trees and crops under this project.

·It's important is **to transplant some plants grown at the lower places in watershed demonstration practices to higher land**. The trees and crops grown in lower places in the

practices were waterlogged and died due to recent water level rise in rainy season 2023. The water level of the Paung Laung is likely to rise up in coming years, and some plants of trees and perennial food crops grown at the lower outskirt of the demonstration sites should be transplanted to higher places of the orchard in coming rainy season.

·Fund allotted for trainings should not be shifted to other additional project activities as the trainings promote capacity of the project staff and participating villagers, and also share new information and skills to them.

·Staff of the FRI working in this project should be assigned their project duties until the end of the project implementing period. At the time of evaluation, the project staff are working well, and these skillful staff should remain unchanged until the completion of the project implementation.

1 INTRODUCTION

1.1 Project brief

The goals of the project "Integrated Forest Ecosystem Management Planning and Demonstration in Greater Mekong Sub-region Myanmar Site [2018P4-MYR]" are to conserve forest germplasm resources and rehabilitate forest ecological services and forest productivity through establishment of arboretum and implementing integrated watershed forest management in Palaung watershed area. The project was implemented by FRI, Myanmar with APFNet's grant of USD 1,120,807 and counterpart contribution of USD 291,670 over 60 months. The project site is located at two different sites: 1) FRI for construction of arboretum and associated thematic gardens, 2) Leinli village for watershed management demonstration practice. To promote the livelihood of participating communities, APFNet has provided a turmeric grinding machine, and the EA has held trainings for local leaders, community mobilizers and participating farmers. The significant point of this project is that it pays attention not only to build up capacity for local staff and community leaders, but also to promote livelihood of the local community and social improvement through project activities. This will ensure sustainability of the project's intervention in the long run at both project sites.

1.2 Evaluation objectives

This MTE is undertaken in the project's 4th year of implementation with objectives to be achieved as follows,

a) To assess project progress and usage of project funds to date against objectives and indicators agreed for the project, and likeliness to achieve project goal and objectives;
b) To identify problems/challenges, and corrective actions and give recommendations to the remaining project activities to ensure project goals and objectives are achieved;
c) To assess and analyze the relevance, effectiveness, efficiency, impacts, sustainability and durability of the project;
d) To give recommendations for future project planning, management and implementation; and
e) To share evaluation findings among stakeholders to make any necessary adjustments in the project follow-ups.

1.3 Evaluation scope and criteria

The scope of this MTE includes project planning, performance of project activities against the objectives, project organizational management, financial management and the effectiveness of budget usage, and the stakeholder´s involvement in the project activities. The scope covers 11 areas mentioned as below;

1) Construction Plan of FRI Arboretum" formulated with satisfactory quality;

2) Forest germplasm resource's introduction and breeding nursery constructed as planned;
3) 9 ha native forest ecological conservation zone established as planned;
4) 16 ha thematic gardens (plantation and exhibition zone) established as planned;
5) Accessory facilities for the arboretum constructed as planned;
6) Integrated watershed management plan formulated with high quality;
7) Demonstration of integrated watershed management practices established as planned;
8) An integrated forest management technology assembled and a technical handbook formulated;
9) Training course for project stakeholders;
10) International exchange on sustainable forest management conducted, and
11) The use and adjustment of project funds are checked against supporting documents like the project proposal, annual work plans, progress reports, project change requests, audit reports and sub-contracts.

2 EVALUATION METHODS AND APPROACHES

The following methodologies are employed in the MTE,

a) Face to face interview with project director, coordinator and staff to know about project implementation status.
b) Focus group discussion among participating communities at Leinli village to know their attitude to the present project, their view on capacity building for future management of the watershed management issue after the completion of the project.
c) Quantitative and qualitative data are collected in field inspection at watershed management planting sites, and
d) SWOT (Strength, Weakness, Opportunity, Threats) method is employed to access the overall status of project implementation.

3 KEY FINDINGS AND ANALYSIS

3.1 Project Relevance and Coherence

3.1.1 Contribution to target region

The present demonstration sites in this project ranks highest in deforestation rate in the regions of Myanmar, and accordingly there would be loss of biological diversity in the area. Besides, the villagers in the project site are in need of hill farming techniques as they were once wetland rice growing farmers in lowland area of Paung Laung forests. Paung Laung dam construction caused their paddy fields to be waterlogged and therefore they had to move to

higher lands in the areas. The villagers are skillful with wetland rice growing, but not in hill land cultivation. Their livelihood has been dramatically changed for the dam construction.

Unless an alternative livelihood is given to the villagers, they will cut trees and NTFP (Non-Timber Forest Products) illegally thereby accelerating deforestation in the region. The worse the deforestation, the faster the biological loss. This project helps the villagers promote hill cultivation skill as a kind of livelihood option, through the demonstration practices in Paung Laung watershed forests. Now the villagers are skilled with hill cultivation and their livelihood is secured and deforestation in the region will reduced.

Again, the project activities are in line with local and national priorities and policies like Myanmar Forest policy 1995, Myanmar Reforestation and Rehabilitation Programme (MRRP), National Forestry Master Plan (2001-02 to 2030-31) and National Watershed Management Policy. Besides that, Integrated Water Resource Management (IWRM) is mentioned in Myanmar's water vision as "in 2040 Myanmar will become water efficient nation with well-developed and sustainable water resources based on fully functional integrated water resources management system". In this regard, the objective of integrated watershed management is to improve farmer's livelihoods and protect the environment in poor and often highly degraded watersheds in the mountainous and hilly regions of Myanmar by promoting a replicable model of sustainable rural development (MIWRM-2014).

3.1.2 Contribution to APFNet priorities

The project is in consistent with the APFNet's strategic plan (2021-2025)- adding green for the Asia and the Pacific. The APFNet's mission is to help the economies and people of the Asia-Pacific region by promoting and improving SFM and forest rehabilitation. The three objectives of this projects are conservation of the plant genetic resources, rehabilitation of watershed forests and promotion of rural livelihoods. In this sense, the objectives of this project are in alignment with the APFNet's mission.

The project will conserve and improve forest germplasm resources though construction of Arboretum in FRI, demonstrate integrated watershed management practice in Paung Luang Watershed and enhance the capacity and knowledge of local community, local government and staff through capacity building programs, which will ensure the sustainability of the forest management once the project is accomplished, finally leading to sustainable forest management (SFM) of Myanmar. In this regard, the project activities and the expected outputs are in compliance with APFNet's mission.

3.2 Project coherence

The FRI is responsible for assisting the Watershed Management Division (WMD) in practicing socio-economic surveys, in testing water and soil quality and in providing suggestions for watershed management for dams. There are 8 projects- 4 TCP (Technical Cooperation project) and 4 Grant projects executed by the FRI. The alignment of the present project and of those projects is, "to enhance the capacity and knowledge of local community through capacity building programs".

Other actor which is implementing in watershed management context is WMD of the Forest Department (FD) , which is implementing a watershed management project covering three streams- Sinthay, Ngalike, and Paung Laung in NPT (implemented during 2021-2027) with funding from national budget.

The main responsibility of the WMD is to protect watershed areas of the large dams across Myanmar. The coherence between the present project and those projects under the WMD is "to protect watershed areas while promoting livelihoods of the local rural communities". Some large projects under the WMD are Inlay Lake greening project in Shan region (2001-2009), Kingda dam watershed management project in middle Myanmar area, and Thaphanseik dam watershed management project in upper Myanmar. Projects under the WMD are implementing works of establishment of watershed plantation, preventing soil erosion, assisting local peoples to establish agroforestry gardens and enrichment planting. In this contrast, the present watershed management project focuses more on "research" though demonstration and livelihood promotion. This project is aligned with those projects mentioned above and therefore the project outcomes are complementary to each other.

3.3 Performance of project implementation

3.3.1 Output 1 "Construction Plan of FRI Arboretum" formulated

Activity 1.1 Survey on current condition of FRI arboretum

Activity brief: The survey on current conditions of FRI arboretum was done in 2020. The forest resources of FRI Arboretum have been inventoried from May to June 2020 in the FRI. A total of 131 species covering 40 families have been recorded in the survey.

***Progress*:** 100% completed

Evaluators' judgement: The result of this survey supports the construction of arboretum. The results could be used for comparison after the completion of the project.

Activity 1.2 Development of construction plan of FRI Arboretum

Activity brief: Villa Landscape Company drafted the Construction Plan of FRI arboretum. Two times of virtual meeting with international consultant, Dr. Zhang Jinfeng, Research Professor of Yunnan Academy of Forestry and Grassland, landscape design experts from Green Villa Landscape Company and project team members led by the project Director were conducted in August and September 2020. This activity includes designing of upgrading nursery, establishment of native forest ecological conservation zone and 7 thematic zones(including bamboo zone, ornamental plant zone, medicinal plant zone, rare and endangered tree species zone, economic tree zone, precious timber tree zone, and aquatic zone) as well as accessory facilities(such as roads, and trail).

Progress: 100% completed.

Evaluator's judgment: The design for the construction plan of FRI arboretum was discussed amongst local and international experts in a transparent way. Location for zones and education facilities are systematically determined.

Figure 1 Design for arboretum construction (Source: Annual Progress Report, 2020)

Activity 1.3: Evaluation and finalization of construction plan of FRI Arboretum

Activity brief: The construction plan of FRI arboretum was finalized on 21 September 2020 on meeting chaired by the Director of the FRI. A total of 24 participants, including the project staff, NGOs, INGOs and construction company staff, was present on the meeting and decided the establishment of 8 zones and trail.

Progress: 100% completed.

Evaluator's judgement: The present design of the arboretum is in accordance with the design agreed upon.

3.3.2 Output 2 Forest germplasm resources introduction and breeding nursery constructed

Activity 2.1 Upgrading and reconstruction of nursery, include construction of seedling bed, shading system, irrigation system and fence.

Activity brief: This activity is to upgrade existing nursery with the capacity of 50,000 seedlings into the capacity of 100,000 with the dimension of 35 m (length) x 27 m (width) × 3.6 m (height). The Perfect Strength Company constructed the new nursery. The water tank with the capacity of 800 gallons was constructed and the irrigation system was installed.

Progress: 100 % completed.

Evaluator's judgement: The nursery is well constructed with watering facility.

Figure 2 FRI Forest nursery and watering facility (by Aung Myo Thu, 2023)

Activity 2.2 Forest germplasm resources collection

Activity brief: To facilitate the germplasm resources collection, a greenhouse in the dimension of 10 m x8 m x 4 m was built by the Parent House Construction company in 2021. 50 different germplasm resources were collected as mentioned in the proposal and the target amount was collected as reported in annual progress report 2.

Progress: 100% completed.

Evaluator's judgement: Greenhouse accommodates the collected germplasm resources (species), and they grow well in greenhouse. But the greenhouse needs stable electricity supply and fund should be secured for maintenance of the greenhouse and plants in it. In this case, fees collection to the arboretum and the greenhouse should start as early as possible to provide some funds to solve the said issue.

Activity 2.3 Seedling raising

Activity brief: About 1000 seedlings of each species have been raised. 5000 seedlings were distributed to local farmers from Leinli village to plant in the agroforestry demonstration plots in 2022. Some 3000 seedlings were distributed to local forest farmers from Chaungmange village for the purpose of agroforestry development. The remaining seedlings are keeping in the nursery for genetic conservation.

Progress: 100% completed.

Evaluator's judgement: The nursery is well equipped with watering facility and it has the capacity of 100,000 seedlings raising. Species for Leinli demonstration practices and for thematic zones should also be raised in the nursery to replace the dead seedlings.

Figure 3 Greenhouse building (by San Win, November 2023)

3.3.3 Output 3 9 ha native forest ecological conservation zone established

Activity 3.1 Demonstration of enrichment planting of key species

Activity brief: 100 seedlings will be planted in each hectare of the zone. A total 600 seedlings of native tree species such as Teak (*Tectona grandis*), Pyinkado (*Xylia xylocarpa*), Tamalan (*Dalbergia oliveri*) and Padauk have been planted in the gap areas to enrich the natural forest zone. Two times of weeding for 9 ha and coppicing were carried out to make seedlings grow well and improve the trees' growth. According to the proposal, 900 seedlings are committed to plant. 600 seedlings were planted in 2021.See in figure 4, teak and some seedlings were planted.

Progress: 67% (600 planted/900 to be planted x 100)

Evaluator's judgement: A total of 10 different tree species (Teak, Pyinkado (*Xylia xylocarpa* (Roxb.) Taub, Padauk (*Pterocarpus macrocarpus* Kurz), Thityar (*Shorea obtusa* Wall)., Ingyin (*Shorea siamensis* (Kurz.) Miq) are planted, and most of the species are matched with the present site. In the project proposal, 29 species in the zone was discovered before the replanting activity. It needs to enumerate species right now or at the time of project completion. The natural forest zone is full of plants and trees as shown in the photo below. Fire prevention in open season is required. This is a successful conservation zone comprised of many trees and a trekking lane is built in the zone.

Figure 4 Demonstration of enrichment planting (by San Win, November 2023)

Activity 3.2 Maintenance of the forest ecological conservation zone

***Activity brief*:** The ecological conservation zone (9 ha) was established in the east of the FRI compound. The planted seedlings were maintained (such as mulching, weeding and fertilizing) and monitored from fire and human disturbances.

Progress: 100% completed (no commitment for planting, maintenance only). Follow up activity of fire prevention is needed)

Evaluator's judgment: The zone is well established and suitable for public recreation.

3.3.4 Output 4 16 ha thematic gardens (Plantation and exhibition zone)

Activity 4.1: Establishment of 3 ha bamboo garden

Activity brief: According to the project proposal, up to 50 species of bamboo species will be collected thorough the economy. The collected seeds and seedlings will be raised in the nursery around four months. The bamboo seedlings will be planted with a spacing of 20 m x 3 m (~150 clums per ha). But in Annex 5-1, it is mentioned that 600 seedlings would be planted. There might be some calculation mistake in development of the proposal. The 3 ha bamboo garden was established in 2020 within the FRI compound, and replanting was done in the place of dead bamboo plants in 2023. The bamboo seedlings (90%) and bamboo rhizomes(10)% were transplanted by the project staff (Aung Zaw Moe (Mr), Ye Lwin Aung (Mr), Su Myat Hnin (Ms), Phyu Phyu Hnin (Ms) and Ye Win Oo (Mr)). In the second project year, Toe Naing (Mr) and Salaing Myo Myint Oo (Mr) replanted in the places of dead bamboo plants. Bamboo species of Wabo, Wamin, Wa net, Kya Thoung, Hmyin, Thaik, Tin, Wa Ni, Kyakhat, Kalway, Kayin wa and Shwe wa, Hmyin wa phyu, Kya thaung, Kim sone wa, Ta pin taing wa were planted. A total of 325 bamboo seedlings was originally planted in 2020, with spacing of 20m ×3 m, covering an area of 1.5 ha. In successive years of 2021, 2022 and 2023, dead bamboo plants were replaced by mainly Hmyin (*Dendrocalamus strictus*) which is the most suitable bamboo in the present bamboo garden. Hmyin (140 seedlings), Wamin (21 seedlings), Shwe Wa (14 seedlings), Wabo (20 seedlings), Kya Thoung (3 seedlings), Kya Khat (1 seedling) and Tin Wa (1 seedling) were re-planted in the dead bamboo plants in 2021. The Hmyin bamboo plants grow well in all places, and Wa net, Shwe wa are also growing well in low-lying place along the water stream. Some bamboo species like Wabo plants are wilting.

Figure 5 Forest ecological conservation zone (9 ha) is well maintained with fire prevention and trekking lane (by San Win, November 2023)

Progress: Partially completed 58% if total planting target of 450 is considered. or 43% if the target 600 seedlings is taken into consideration. The EA needs to plant some more bamboo seedlings in next year so that to reach 450 or 600 survived bamboos in the zone. The current survival rate is calculate based on the planted seedlings (325) in 2020-21, and it gives 73%. The following table shows the present bamboo plants surviving status in the garden.

Evaluators' judgement: Species selection should be careful in bamboo planting as bamboo species is soil and site specific. Fire prevention is needed in coming hot season and re-planting

the dead plants with seedlings will be needed in coming rainy season. Site and some planted bamboo species are somewhat poorly matched, and this results in small failure for survival rate for bamboo zone. Replanting of *D strictus* or *D membreneous* is recommended in next years.

No	Bamboo species	No of plants	Avg; height	Local names	Planted number in 2020-21
1	D membranaceus	30	10	Hmyin waphyu	30
2	B arundinaceae	1	13	Kya khat wa	1
3	C pergracile	17	4	Tin wa	17
4	D brandisii	11	7	Kya lo wa/Wabo	33
5	D strictus	128	6	Hmyin wa	172
6	D latiflorous	7	6	Wani bar	7
7	B vulgaris	9	6	Shwe wa	10
8	D longispathus	13	5	Wa net	28
9	B tulda	20	10	Thaik wa	33
10	B polymorpha	7	3	Kya thoung wa	13
11	B wamin	12	4	Wamin	16
12	Melocanne bambusoides	2	5	Kayin wa	2
13	B beecheyana	2	5	Kim sone wa	2
	At present plants	259		Previous planted	354

Table 1 Survival of bamboo plants

Note: Survival rate for bamboo zone is at 73%, and height in feet

Activity 4.2: Establishment of 3 ha ornamental garden

Activity brief: According to the project proposal, 100 ornamental species would be collected, and 450 trees per ha would be planted thus requiring 1350 seedlings. An ornamental garden of 3 ha was established in FRI compound in 2020 and now the total species is at 50 and total seedlings is at 675. ~~and a total of 34 ornamental tree species was planted.~~ The garden was established by project team, and successive maintenance activities are mainly supervised by Mr. Kyaw Soe, member of project implementation unit (PIU). The ornamental trees are growing well around the water pond. The species planted in this zone are kant-kaw (*Mesua ferra*), Saga-byu (*Michelia baallonii*), Saga-wah (*Michellia champaca*), and Kadi-bar (*Persea gratissima*). 225 seedlings and 450 seedlings were planted in project year 1 and 2.

Progress: Partially completed (50 percentage completed). Species collection at 50% and seedling planting at 50%.

Evaluators' judgement: The site selection for the said tree species are alright and growing well. The EA needs to collect some 675 seedlings covering 50 species to grow in this zone.

Activity 4.3: Construction of 2 ha medicinal plant garden

Activity brief: Collection of 100 medicinal species is committed in the proposal. 100 species of the medicinal plant were collected and seedlings were raised by Dr Mu Mu Aung (Ms) in FRI compound and then transplanted to present garden in 2020. At the time of investigation, Tin Tin Mu (Ms) explained the existence of medicinal plants as Dr Mu Mu Aung is out of office at the time. Some medicinal plants were in potted seedlings.

A total of 80 different medicinal species were established in 2020. Some medicinal trees, shrubs and herbs are growing well in the medicinal garden whereas site-species unmatched plants are dead. An example is that agarwood (*Aquilaria agallocha* Roxb) plants (about 2 meters in height) are dead at the time of inspection in the medicinal garden.

Progress: At least 50-80 percentage completed.

Evaluators' judgement: Medicinal plants of different species are planted on ground and in pots. Daily care and good management is required as some medicinal plants need daily or one-day alternative watering, and congested medicinal herbs and shrubs should be transplanted in new pots.

Figure 6 Some medicinal plants are planted in the pots (by San Win, November 2023)

Activity 4.4 Construction of 2 ha rare and endangered tree species garden

Activity brief: The rare and endangered tree species garden was established in 2020 in FRI compound, and the head of this tree species garden is Dr. Yu Ya Aye (Ms). In the project proposal, it is mentioned that 50 species covering 900 seedlings would be collected. 38 species covering 700 seedlings were planted in year 1 and 2. Nowadays, project team mainly conducted the maintenance work of this garden with the help of Project Implementation Unit (PIU). The EA used IUCN listed rare and endangered species as criteria for choosing rare and endangered species, and some commonly known trees species are also rare species in Myanmar. In my field investigation, most rare and endangered species are growing well and are under comprehensive care of weeding, pruning and fire prevention in open season for good survival.

Progress: 76 % species collection and 78% for seedling planting completed.

Evaluators' judgement: It is too early to say a successful planting for endangered and rare trees mainly for the seed/seedlings were transplanted to present location. It may need 10-15 years to wait and see the survival of those trees. Special care is required, like watering, fire prevention, fertilization and replanting in the place of dead plants. Rare and endangered species are Yepadon (*Bischofia javanica*), Kanyin (*Diterocarpus alatus*), Saga-sein (*Cananga odorapa*), Zaungbalway (*Lagerstoremia villosa*), Taungsaga (*Myristica amygdalina*), Thai Pyinkado

(Sindora siamensis), Pan-padauk (*Pterocarpus indicus*), Pyinkado (*Xylia xylocarpa*), Myauk-loak (*Artocarpus gomeziana*), Leza (*Lagerstroemia tomentosa*), Letpankhar (*Astonia scholaris*), Kalamet (*Monsonia gagei*), Tissue tamalan (*Dalbergia oliveri* (Tissue culture)) and Thawkamarlar (*Castanospermum austral***).**

Figure 7 Rare and endangered zone (by FRI)

Activity 4.5 Establishment of 2 ha economic tree garden (Renamed as fruit tree)

Activity brief: In this zone, 50 species covering 900 seedlings would be planted as mentioned in the proposal. In year 1, some 25 species covering 450 seedlings and in year 2, a total of 10 species covering 172 seedlings was planted. Fruit trees of Ziphyu, Peine, Mango, Phankha, Gway thi, Kanazo, drumstick, Kyaungsha, Thi, lime, Kyaukmout, dragon fruit, kyazu, Thit saint, Madaw, Lychee, Tamarind, Okshit, Wetthicha, Oh hne, Ye Thaphan, Thabyu thabyay, Avogado, Si thabyay, Nga pauk thi pin, and Pet Than were planted in 2020 in 2 hectare area of the FRI compound. The head of this tree species garden is Dr. Thant Shin (Mr). Nowadays, project team mainly carry out maintenance activities of this garden with the help of PIU. The plants are growing well except dragon plant, Kanazo and avocado plants. Some plants need comprehensive care for survival.

Progress: 70% percentage for species selection, 69% for seedling planting completed.

Evaluators' judgement: The EA needs to collect 15 different species and 278 seedlings to be planted in coming year. Comprehensive care and protection from untimely picking fruits by outsiders are needed as some fruit trees like Gway, Ziphu are fruiting now.

Figure 8 Mango in economic zone (by San Win, 2023 November)

Activity 4.6 Establishment of 2 ha precious timber tree garden

Activity brief: According to the proposal, 50 different species covering 900 seedlings would be planted. In the first two years, 25 species covering 225 seedlings were planted. (However, in APR-3, it is mentioned 275 seedlings were planted in year 1 and 2).The commercially important species are Teak, Kalamet, Tamar, Tamalan, Padauk, Pyikado, Pyin Ma, Phet Than, Ma Ni Auga, Yay manay, Mahogany, Yin dike, Yin mar, Yin sat, Leza, Yone, Thin win, Ingyin, Thingan, Linlun, Thit saint, Thin win phyu, Madam, Phan kha, Zaung Pa Lway and Thakut. The head of this tree species garden is Hla Myo Aung and Dr. Tual Chint Khaine (Mr). Nowadays, project team mainly carry out maintenance activities of this garden with the help of PIU. The plants are growing well as they are mostly hard trees and fire prevention is needed as the trees are at young age.

Progress: 46% for species collection, and 28% for seedling planting are completed.

Evaluators' judgement: Comprehensive care and prevention from untimely harvesting or cutting by outsiders are needed as some commercial trees like, Yindike, Kalamet, Teak, Pyinkado and Tamalan are rare and precious. The EA needs to collect some 17 different species and 600 seedlings to be planted in coming years.

Activity 4.7. Establishment of 2 ha aquatic garden

Activity brief: A 2 ha pond was dug in the year 2021 under the supervision of Director and Deputy Director of the FRI. Some perennial trees were planted around the pond in the year 2022. The tree planting activity was originally not included and was funded by FRI. Trekking lane around the pond has also been made. And some red and white-water lilies are grown in the pond.

Progress: 100% percentage completed.

Evaluators' judgement: The pond with trekking lane, lilies in the pond in deep water and trees growing around the pond provides aesthetic view to the visitors, and an opportunity for aquatic researchers.

3.3.5 Output 5 Accessory facilities for arboretum constructed

Activity 5.1 Construction of arboretum entrance

Activity brief: The construction of arboretum entrance has been done by Aungyadanar Moe Company and supervised by Dr Ei Ei Swe Hlaing and completed in 2022. The dimension of the entrance is at 4 m in width and 3.5 m in height.

Progress: 100% completed.

Evaluator's judgement: The design of the entrance is attractive and it is located roadside of the main FRI's main entrance road.

Figure 9 Arboretum entrance (by San Win, 2023 November)

Activity 5.2. Construction of 3812 m road/trail system

Activity brief: Eight thematic gardens were connected by trail lane (2,821 m x 1 m) and the arboretum lane (760 m x 4 m) connects water lab and main entrance road of the FRI. The buggy road (400 m x 2 m) is constructed encompassing fruit tree zone, and arboretum road (300 m x 4 m), connects the entrance of the arboretum and main road of the FRI.

Progress: 100% completed.

Evaluator's judgement: The construction works are well done. The road networking makes the FRI more aesthetically appealing to the staff and visitors as well.

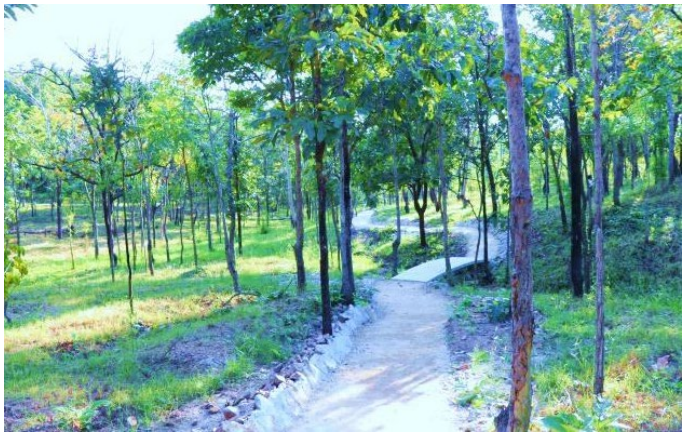


Figure 10 Trail constructed in the tree planting zones (by FRI)

Activity 5.3 Construction of 1982 m irrigation system

Activity brief: This activity is to be constructed for 1982 m long irrigation system, and it was completed by Ponnahmi Company Limited in 2021. The actual length is at 2333 m. The construction completion report was also reviewed by the evaluator.

Progress: The construction is 100% completed.

Evaluators' judgement: The main pipe from the water pump engine is at 4 inch in diameter, connected to pipes 3 inches, 2 inches, 1 inch and ½ inch in diameter at the distribution lines.These irrigation systems help promote survival and growth of plants grown in respective garden zones particularly in summer times.

Figure 11 Connecting water pipes (by FRI)

Activity 5.4 Establishment of tree identification system (Not yet implemented)

Activity brief: It's planned to sub contract the bar-coding system service to identify tree species. However, the activity was postponed to be implemented in the year four according to the approved project revision request

Progress: The EA has communicating to a company for bar coding.

Activity 5.5 Construction of 3650 m forest fire control line

Activity brief: The fire control line was built by workers under supervision by Toe Naing (Mr) and Kyaw Soe (Mr) in the year 2020. It is supposed to be 3,250 m in length and 2 m in width. Some 2,000 m was made in year 1. Annual fire line cleaning is made at the time of opening season (normally falls in December). Fire line is in place at the tree planting zones and aquatic zone.

Progress: 55 % completed. (Seasonal cleaning to fire line is required)

Evaluators' *judgement*: The fire lines are observed in the tree planting zones and aquatic zone. Fire line is in place and regular cleaning is needed, especially in opening season.

Figure 12 Fire control line making (by FRI)

3.3.6 Output 6 Integrated watershed management plan formulated

Activity 6.1 Baseline investigation include social economic situation, threats for forest degradation.

Activity brief : Baseline investigation on social, economic situation, and potential threats for forest degradation have been carried out in the year 2020 under the supervision of Ye Lwin (Mr), Tin Hnung Aye (Ms) and other 10 researchers of the FRI. According to the survey result, family size at 3-5 persons, 50% of family own land legally. The peoples are 100% forest dependent peoples. Turmeric is major crop for the families, and annual income is less than 5,000,000 kyats. Villagers prefer reforestation through agroforestry practice. Shifting cultivation is major cause for deforestation. Teak, Yemane and Padauk trees are supported to grow by farmers.

Progress:100% completed.

Evaluators' judgement: The result and information generated in the baseline investigation could be used as a benchmark for project implementation, and form a basis for development of watershed management plan. Besides, the information was useful for the following project implementation.

Activity 6.2. Development of participatory integrated watershed co-management plan

Activity brief: A national consultant was hired to develop a participatory integrated watershed co-management plan, which aims to establish agroforestry demonstration plot for 100 acres with the participation of Leinli villagers in Paung long watershed management area. The consultant found that farm land size is too small (<1 acre), income from livestock raring is very minimal, deforestation is happening due to shifting cultivation. Non Timber Forest products are major income for the villagers, especially for landless villagers. Farmers are interested in planting trees and agricultural crops in mixed pattern. They are also interested in attending trainings on bamboo-based handicraft, home business, com-post makin and forest

nursery. Value-added products using local raw materials should be emphasized for livelihood promotion.

Progress: Successfully completed.

. ***Evaluators' judgement***: The watershed management plan is useful for follow up project activities to fulfil the second objective of this project.

3.3.7 Output 7 Demonstration of integrated watershed management practices established

Activity 7.1 Seedlings preparation for integrated watershed management practices

Activity brief: According to the project proposal, a total of 24,768 seedlings would be produced for planting of 72 ha. A total of 5230 seedlings (3,128 timber seedlings and 1000 food trees, and 1102 bamboo seedlings) was produced in year 1 according to APR-1. In year 2, 4000 timber tree and 4000 fruit tree seedlings and 1250 bamboos were planted (Source, PMT). In year 4, a total of 10860 seedlings (timber tree 5860, fruit tree 4000, and bamboo 1000 seedlings) were raised and planted. A total of 25340 seedlings was produced and planted.

Progress: 100% completed.

Evaluator's judgement. *Timber trees of* Padakuk (*Pterocarpus macrocarpus)*, Thin-win (*Millettia pendula)*, fruit trees species such as Chin-danyin (*Parkia speciose)*, Jack fruit (*Artocarpus heterophyllus*) and Lemon (*Citrus limon*), and Wabo (*Dendrocalamus giganteus)* were raised in the forestry nursery of forest range (located at Leinli Forest Beat Office compound) and community temporary nursery**.** The selected species are appropriate for Leinli demonstration sites.

Figure 13 One bamboo clump, growing in a lower place of the plot, was dead. Another bamboo clumps growing at higher places are growing well (by San Win, November 2023)

Activity 7.2 Land preparation of demonstration site

Activity brief: According to the project proposal, 50 ha of shifting cultivated watershed area is prepared for plantation. In year 1 and 2, some 26.7 ha were cleared for plantation and some 16 ha in year 4 were cleared for land preparation. Therefore a total of 43 ha has been cleared, and 7 more ha are to be cleared.

Progress: 86 % completed (43/50x100)

Evaluator's judgement: In activity 7.2, it is mentioned 50 ha of land preparation for demonstration site. But under activity 7.3 and 7.4 , 36 ha and 17 ha (totaling 53 ha) would be established.

Activity 7.3 Demonstration establishment of fruit tree

Activity brief: According to the project proposal, 36 ha of fruit tree plantation would be established. In year 1 APR, it is reported that 10.52 has ha has been established. Of 10.52 ha, 2.43 ha was jointly implemented by local FD staff and the project staff for research purpose. The design is planting perennial fruit trees and seasonal agricultural crops in research plot 1, and intercropping seasonal agricultural crops in-between lines of timber trees. In the year 2, some 16.2 ha, timber trees and food tree mixed, had been established. In year 4, some 16 ha has been established.

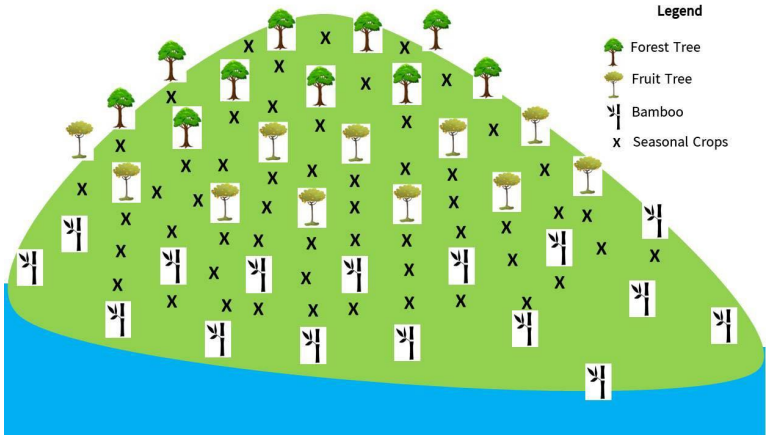


Figure 14 The agroforestry design applied in the project site (Source: FRI, APR-1)

Progress: 80% completed if total area of 53 ha (36 ha in Activity 7.3 and 17 ha in activity 7.4 mentioned in the proposal is taken into our consideration) (In year 1, and 2, a total of 26.7 and 16 ha in year 4 totaling 42.7 ha. If the 42.7 is divided by 53 and multiply by 100, it gives 80%).

Evaluator's judgement: In the project proposal, 334 food trees per ha has to be established. Therefore, the EA needs to plant 12,024 fruit trees (36 ha x 334/ha). If fruit tree enumeration is done at the demonstration site, the exact data will be available.

Figure 15 Jack fruit trees, pineapple plants and Padauk are gown in mixture and the plants growing well with (by San Win, November 2023)

Activity 7.4 Demonstration establishment of timber tree

Activity brief: To protect soil erosion, trees are planted at the top of the hills. 17 ha of timber tree will be established as mentioned in the proposal. Timber trees and fruit trees are intercropped in the field.

In year 1 annual progress report, it is stated as, "Total number of demonstration plots in Year 1 is 10.52 ha (26 acres), of which 8.09 ha (20 acres) was implemented by the local farmers while 2.43 ha (6 acres) was jointly implemented by local FD staff, project members for research purposes and for demonstrating local communities".

In the year 2 annual progress report, it is mentioned as, "During year 1 and year, 26.7 ha of agroforestry plots had been established using the following design". No exact figure for planting area was observed in the report, but it may be assumed as 16.2 ha was established in year 2.

No planting was done in year 3 also, but in year 4 (2023 rainy season), 16 ha of timber trees and fruit trees have been established (That information will be mentioned in year 4 AWP).

Progress: 100 % complete (In the proposal 17 ha has to be established. In reality, 10.52 ha in year 1, 16.2 ha in year 2 and 16 ha in year 4, thus a total of 42.72 ha have been established in agroforestry style (mixed planting of timber trees and food trees in the same place).

Evaluator's judgement: The selected species are appropriate to the present project sites and the trees are growing well. In the project proposal, 334 trees per ha have to be established. Therefore, the EA needs to plant 5,678 timber trees (17 ha x 334/ha). If tree enumeration is done at the demonstration site, the exact data will be available.

Figure 16 Padauk trees are growing very well in the project site (by San Win, November 2023)

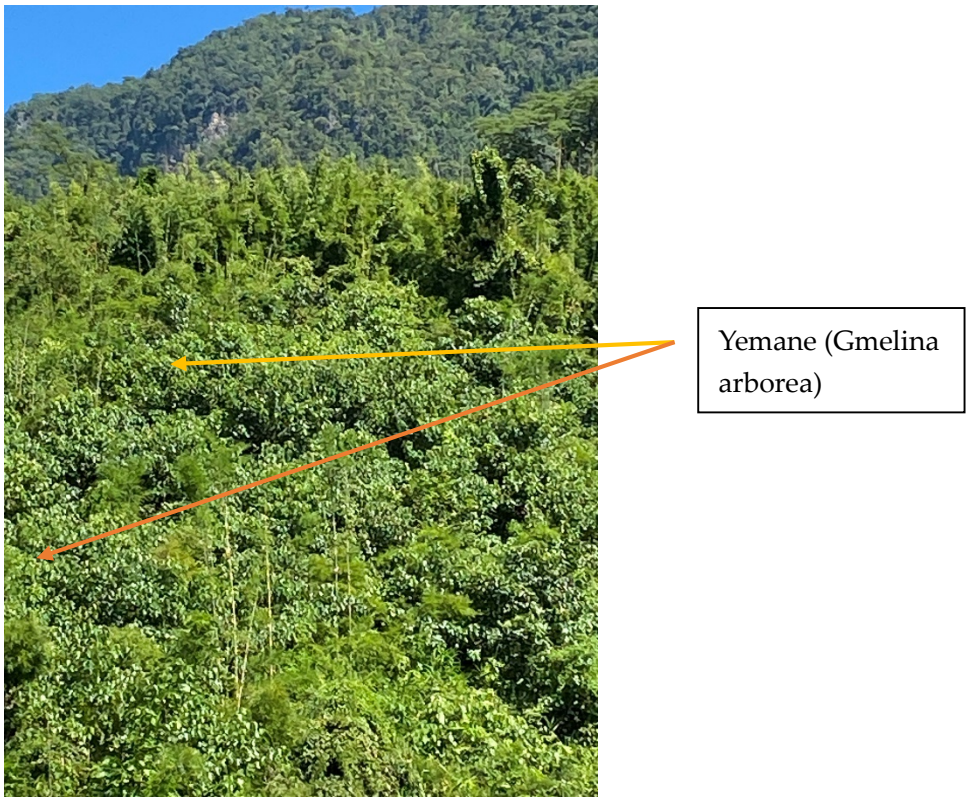


Figure 17Yemane (Gmelina arborea) plantation(by San Win, November 2023)

The growth of both trees and perennial food trees are shown in the table 2 below.

Table 2. Growth of trees and perennial food crops/fruit tree

No	**Farmer name**	**Tree specie**	**Growth**	**Type of plant**	**Year planted**
1	Mg Aye (Mr)	Padauk *	7 m ht 12.5 cm dia	Tree	2020
	Ditto	Pyinkado&	3, 4, 5 m	Tree	2021
	Ditto	Padauk	3.5, 4, 5 m	Tree	2021
	Ditto	Danyin**	5.8 m ht 7.5 cm dia	Fruit tree	2020
	Ditto	Jackfruit	4 m ht	Fruit tree	2020
		Wabo#	5 m	Bamboo	2020
2	Myint Than (Mr)	Yemane***	7 m	Tree	2020
	Ditto	Wabo#	5 m	Bamboo	2020
	Ditto	Jackfruit	3 m	Fruit tree	2021
	Ditto	Danyin	3, 8 m	Fruit tree	2021
		Jackfruit	3.5 m	Fruit tree	
3	Swe hlaing Tun (Mr)	Yemane***	5 m	Tree	2021
	Ditto	Yemane***	7 m	Tree	2021
	Ditto	Yemane***	8 m	Tree	2021
	* Padauk: Pterocarpus macrocarpus	**Danyin (bitter bean) Parkia speciosa.	&Pyinkado Xylia xylocarpa	ht means height & m means metre	***Yemane : Gmelina arborea Wabo#: D brandisii

The watershed management plantations at Leinli village are extremely successful owing to the EA's diligent efforts and active cooperation of the participating farmers. For security reason, and time limitation, information about other farmers' tree growth can't be collected.

Activity 7.5 Maintenance and monitoring of demonstration sites of integrated watershed management practice

Activity brief: To monitor the project activities and feedback back the information to the project team, two communicators are assigned.

Progress: The work is in progress.

Evaluator's judgement: The two communicators are assigned for this purpose-Myint Than (Mr) and Tin Shwe (Mr). The evaluator met them and asked some question about their works. They patrolled frequently to the demonstration sites and informed the participating farmers for regular maintenance of their plantations (for fire prevention and weeding). They communicate with the project team through phone and social media to report the project

situation. Besides, they also work in turmeric grinding business to assist the business. Myint Than (Mr) is chairperson of the turmeric business at the Leinli village.

3.3.8 Output 8 An integrated forest management technology assembled and a technical handbook formulated

Activity 8.1 Summarizing technologies and experience of integrated watershed management practices

Activity brief: To document the experiences and useful technologies gained from this project and to disseminate the information in different forms of communications- through the workshop and the technical handbook.

Progress: 10% completed

Evaluator's judgement: The project team is working to implement the activity and some project experiences have been published in forestry newsletter.

Activity 8.2 Development of technical handbook on integrated watershed management

Activity brief: To share the experiences and lessons of the project, a technical handbook will be published.

Progress: O%

Evaluator's judgement: Not yet implemented.

3.3.9 Output 9 Training courses for project stakeholders

Activity 9.1 Training for young researchers on integrated forest management technology and rehabilitation of degraded forest

Activity brief: support to ensure the long-term sustainability of the project, young researchers will be given training on integrated forest management technology and rehabilitation of degraded forest. Two time of trainings (3 days in each time) would be conducted as mentioned in the proposal.

Progress: 50% completed

Evaluator's judgement: One training has been conducted in 2021 reported by the EA. One more training will be carried out in 2024.

Activity 9.2 Training course for local officials and local leaders on integrated forest watershed management

Activity brief. A total of 25 trainees of local leaders have attended the training dated on 7 December 2023, reported by the EA. Two time of training would be conducted as per the project proposal.

Progress: 50% completed

Evaluator's judgement: One training on the same theme will be conducted in year 4 (2024).

Activity 9.3 Training course for local farmers on tree seedling raising, planting, agroforestry, organic farming, maintenance of fruit orchard and tree plantation, fruit processing and marketing

Activity brief: Trainings on (i) Integrated watershed forest management, (ii) Nursery techniques (iii) Tree planting and fruit orchards (iv) sustainable utilization and production of value-added products from NTFPs, and (v) Food processing and marketing are intended for local farmers to promote their knowledge on these topics. According to the proposal, 2 trainings for each topic will be convened.

Progress: 40% completed

Evaluator's judgment: 4 trainings have been conducted until the end of 2023. In year 4, two more trainings will be conducted and 4 trainings will be conducted in year 5.

Activity 9.4 Formulation of a training manual

Activity brief: to share the experiences and lessons of the project, a training manual is to be developed. English version is said to be available for the manual.

Progress: 0% completed

3.3.10 Output 10 International exchange on sustainable forest management conducted

Cancelled.

4 Project achievements

Firstly, the establishment of arboretum has been accomplished in FRI compound.

·Forest germplasm resources introduction and breeding nursery have also been completed. Seedlings were raised and distributed the seedlings to Leinli villagers and to local public at the tree planting event.

·9 ha native forest ecological conservation was established through enrichment planting of key species into gap areas. Now this zone is well maintained and will be a good seed source in future.

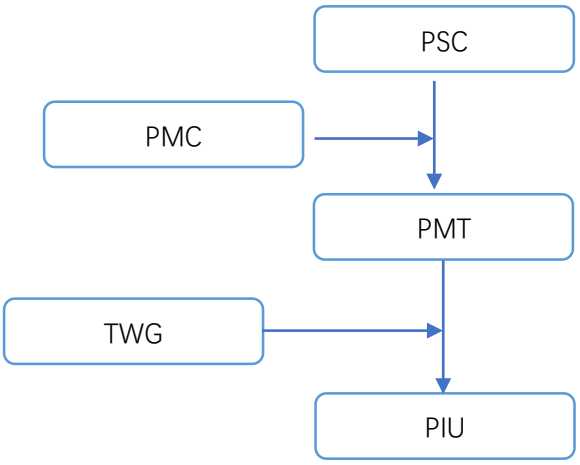
·The ornamental plant garden has also been established partially, with a water pond and a small wooden bridge. This zone is truly appealing to some university students.

Secondly, the demonstration of agro-forestry in Leili village has produced enhanced the villagers' livelihood by increasing their knowledge and skills in hill cultivation, and producing value-added products.

5 Performance of project management

5.1 Project communication and dissemination

Project communication structure is illustrated in the diagram below.



Projects Steering Committee (PSC) steers project implementation, inspect annual work plan and activity report, assess project implementing process, and give guidance the important issues during the project implementation. PMC is responsible for monitoring all projects under the FD. PMT, headed by the FRI Director, is responsible for the project organization, coordination and implementation, financial accounting, communication and coordination. PMT is assisted by TWG and PIU. TWG is also called technical support team. The TWG is composed of the experts from FRI who are specialized in forest management, community-based forest governance, agroforestry management techniques, forest protection. TWG provide technical service to PMT. PIU is the basic unit for project implementation.

In the Project management team (PMT), the communication channels are well established and the PMT holds formal meetings for discussions on monthly progress reports and issues encountered. As there are two project sites, one in FRI compound and the other in Leinli village, the PMT holds regular visits to the thematic planting zones once every two weeks. Technical working group also conducted meetings once a month on the thematic tree planting zones in Year 1 and Year 2. For demonstration site of Leinli village, Paung Laung watershed area, regular site visits were conducted by the PMT monthly, except for some months affected by travel restrictions due to COVID-19 pandemic. Weekly progress, however, was made by the local community mobilizers to the PMT through phone or internet (Viber or Facebook messenger). The updated information on project activities could thus be achieved during the travel restriction for pandemic disease.

Besides, monthly expenditure of project activities is checked by the Project Monitoring Team of the FD and the Director of the budget division of the FD. Annual budget use and work progress of the project are checked by the Office of the Auditor General of the Union (National Audit) and external auditing firm once a year. Monthly progress reports are developed by PMT, and disseminated to the Minister office through Director General of the FD. Meanwhile, progress of project activities is reported to the PMC twice a year, and to the PSC once a year.

5.2 Project management and implementation team

The PMT was also formed to manage the project, and the Director of the FRI acts as the chairman of the PMT. There are 14 members in the PMT and they are responsible for inspecting the thematic gardens twice a month, monitoring the works done by PIU, presenting work

progress to the Project Monitoring Committee (PMC) of the FD, and present works in time of urgency, if any, to the Director of the FRI. The PIU consists of 5 forest rangers of the FRI, and their responsibilities are to manage the activities to be implemented in thematic zones, to monitor day-to-day project activities implementation, to follow guidelines developed by the PMT.

5.3 Monitoring, evaluation and reporting

PMT is responsible to submit the monthly progress reports to the Director General through PMC of the Forest Department (HQ) for monthly review on the project implementations. Planning and Statistics Division and Finance Division of the FD (HQ) also review performances and budgetary allocation of the implementation process. The project team is also responsible for presenting project progress in person at the meeting of PMC, which is scheduled to hold meeting twice a year.

5.4 Project consultancy

The project team hired national consultant for developing a participatory integrated watershed co-management plan for demonstration of watershed management practices. For pandemic disease reason, no international expert for this project was assigned. The Arboretum landscape construction plan and related facilities were subcontracted to local companies.

5.5 Project financial management

The departmental audit of the Forest Department is responsible to check and monitor the project fund uses. The Director of the Budget Division at the Forest Department is member of the PSC. In addition, there is an auditing and accounting firm which checks and monitors the fund used annually.

6 Project Impacts and Sustainability

6.1 Project benefits

The most significant positive effect from social aspect is that the villagers' livelihood is secured by this project implementation. The villagers also gained some knowledge and skills in hill cultivation, and small business enterprise to promote their livelihood. Additionally, universities students in the vicinity of the FRI could visit the arboretum to study biological knowledge and plant genetic for in-situ and ex-situ plants in the same areas.

In terms of environmental aspecty, the planting zones of agro-forestry demonstration sites are located in Yezin and Leinli watershed areas and they conserve soil and ameliorate macro climate in its immediate areas. Similarly, watershed plantations will prevent soil erosion to the Paung Laung dam in the long run.

6.2 Issues, challenges and lessons learnt

One of the challenges in project implementation is budget year difference— Myanmar budget year starts in 1st April and ends at the end of March every year. According to the project agreement (Oct 2019 to September 2024), the EA will submit annual progress report, work plan and funding request for next project year to APFNet for review and acceptance. With APFNet's acceptance, the fund will be allocated to the EA.

Governmental departments in Myanmar have to make financial request a year ahead to the central government, and this request is called B.E (Budget estimate). To implement the project activities, the EA has to develop and inform the BE to the government one year ahead though how much fund will be granted by the APFNet is not known. The EA seems to give some reasons or explanations to the MoNREC for budget surplus or deficit at the end of the budget year.

6.3 Project Sustainability and duplicability

The project developer, now as Director General (DG) of the Forest Department, said that he would explore other funding sources to sustain the project activities in post-project period. Before the funding source is secured, he would like to add some extra fund to support the follow up activities after completion of this project. He also expressed his willingness to duplicate this project best practice in other areas as there are more than 200 medium and big dams, across the economy and all those dams' watershed areas also need vegetation cover.

Apart from this, the Deputy Director of the FRI mentioned that FRI will try its best to ask additional budget for maintaining the project activities in post-project period despite that the FRI's annual budget is remained unchanged or little increased though the currency deflation is somewhat high. It's estimated that annually 25,000 USD or 50 million Kyats is needed to sustain the thematic zones (including the watering, fire prevention, fertilization, electricity and nursery material). Some fund may be earned from education center or through further cooperation with other agencies, like Xishuangbanna Tropical Botany Garden, Chinese Academy of Science, which has signed MOU with FRI on biological diversity conservation.

7 CONCLUSIONS

Based on the results of site visits and documents review, the evaluator may draw the conclusion as follows,

7.1 Except some project activities, most activities were implemented as scheduled. Due to the project fund constraint and outbreak of pandemic disease of covid-19, the construction of the extension hall has not been implemented. Similarly, international exchange study visits to other 2 GMS project sites have been cancelled. The trainings for local community for livelihood promotion (food processing and marketing training for local peoples, training for local leaders for integrated watershed management in Activity 9.1), technical handbook publication (Activity 8.2), QR barcoding and labelling plants (Activity 3, 4,5) are postponed.

7.2 Most activities have reached its expected outputs. But it was also found that some bamboo plants died in bamboo zone as they are not suitable for present site. All the dead plants have been replaced to some extent with Hmyin bamboo (*Dendrocalamus strictus*), which can withstand the topography and climatic conditions of the present sites. Additionally, a water stream is running through the bamboo zone, and some small check dams along the stream should be constructed to ensure fresh water availability for plants' survival in open season.

Apart from this, some plants, for example yew tree, need lower temperature for their survival. Therefore, the EA has installed two stand fans and two stand air conditioners to keep room-temperature of greenhouse building lower. But stable electricity supply is one issue to be taken into consideration for long term.

7.3 The expected projects outputs will surely be obtained if funding supports are secure and on time. No extra energy will be needed by the project implementing staff if the said issue is resolved.

7.4 Inter planting timber trees with perennial fruit trees at the demonstration site of Leini is very worth learning for those who would like to duplicate the success in other watershed management areas. This success reflects diligent efforts made by the project staff, and active cooperation from participating farmers at Leinli. The domestic expert's suggestions for choice of species and planting design also foster the success. But, bamboo plants were flooded because of water level rise and the planting of bamboo should be placed at a higher place of the demonstration sites.

7.5 Providing a grinding machine for making turmeric powder is a significant project intervention as the villagers now came to know they can earn some more money by adding value to their products than selling it in raw form. In my personal interview, the villagers are now eager to produce brooms by themselves instead of selling raw broom grass (*Thysanolaena latifolia*). Similarly, they are interested in making mosquito repellent coils by using their farm products of turmeric. This project encourages or stimulates the farmers/villagers to extend their knowledge on finished or value-added products making. The more they are interested in value added product making by use of raw materials from their farms, the less disturbance to their surrounding environment- land, water, biological resources (mainly forest) thereby reducing negative impacts to present watershed areas.

7.6 Project management is efficient with the collaboration of PMT, PMC, PSC, Director of the FRI and DG of FD on monitoring the project progress technically and financially. Also, construction works were also checked by the tender committee headed by Deputy-DG of the FD.

To further illustrate the project status, the evaluator has made SWOT analysis and concluded as follows,

***Strength*:**

1) Project implementing staff are researchers and foresters. They are familiar with the activities.
2) Thematic zones (9+16) ha are within FRI campus and easily accessible.
3) Villagers' active participation is apparently seen in their works.
4) Project Director and coordinator's pre-arrangement for some activities to be implemented make the project implement smoothly.
5) The project developer for this project became the DG of the FD, which is helpful for project implementation.

***Weakness*:**

1) The selection of some of the diverse plant species turned out to be too ambitious. Some species are not matched with the present site.
2) Not drought tolerant species are selected. Drought tolerant species are suitable in the host institution as the area's precipitation ranges between 1,000 and 1200 mm with an annual temperature at 38°C.
3) No availability of international expert's advice.
4) Assessment for possible water level rise in the Paung Laung dam before the project implementation was not observed, especially for agro-forestry plantation demonstration sites.

***Opportunity*:**

1) The willingness of the local community to participate in the project is a good opportunity. The promotion of local knowledge and skills create opportunities for local empowerment and involvement in conservation efforts.
2) Villagers are much interested in learning how to produce value-added farm products by using their raw materials of turmeric, broom grass, bamboo shoots.
3) Project staff, in particular some young researchers, gained new knowledge and project experience, which can contributes to their professional growth and at the same time enhance efficiency & effectiveness for project implementation.

***Threats*:**

1) Some trained persons for turmeric business rarely work in the project or have moved to other places for better payment. Trainee should be systematically selected for this business by taking into account of their interest in the business and access to market.
2) Travel constraints (to monitor, collect data, hold trainings) impede effectively implement the project activities.
3) High prices of commodities (inflation) is detrimental to project implementation.
4) Secured funding resource for maintenance of all plants and construction work is needed.
5) El Nino effects (severe drought, temperature rises) will exert certain impact on this project implementation.

8 RECOMMENDATIONS

·Some activities have been completed, while some are postponed to be completed. The remaining activities (like the species collection, planting seedlings, fire line making, replacing the dead plants with appropriate species) should be done with a defined project approach.

·From the aspect of project planning on watershed management, it is recommendable to select planting sites for watershed management plantation on the results of assessment of possible maximum point of water level. In this project, some planted trees and bamboos are waterlogged because of rise of water level. In short, comprehensive survey of possible risks should be made during and post project period.

·Some tree and plant species grown in the thematic zones are not suitable for a specific site. Examples are those bamboo species of *Dendrocalamus asper (*Kalway in local name), trees of *Aquilaria agallocha* Roxb(Thit-hmwe in local name), Bustard sandalwood(Kala-met in local name), *Cinnamomum multiflorum* Wight (Kalaway in local name), and *Baccaurea Flaccida(*Kanazoe in local name), grow well in southern most areas of Myeik, Dawei and Mawlamyaing regions where annual precipitation is at about 6000 mm. Besides, *Parkia speciosa Hassk* (Chin dinnyin in local name), *Abies densa(*Kyauk Htinchu in local name), and *Dendrocalamus latiflorus* Munro(Wani in local name), prefer cool weather and high elevation areas. The annual average precipitation for the present thematic zones ranges between 1000-1500 mm, and the elevation of the area is at about 150 meters with high temperature, open season in particular. It is therefore recommendable for successive and very comprehensive care to those plants, as they were grown in different weather, elevation and humidity areas and replanting with appropriate plants should be done.

·To carry out follow up activities for maintenance of the project-funded buildings, for fire prevention, pruning the planted trees in the thematic plantation zones, it's recommendable that the FRI should allocate additional budget for the said works in post project period.

· Myanmar has rigid construction rules for it needs to re-start the official process from the very beginning if the design or dimension of a building is changed. For this project, the design of some construction works was changed following the rules of Ministry of Construction of Myanmar, and took weeks to get permission. This explicitly shows if a project has some construction activities, it is better to learn the rules of construction of an economy/region. Or, confirmed design and dimension should be checked at the project proposal stage. Stakeholder consultation on construction issues at the time of project development is plausible.

·Good trainings on operating machine is also important. The turmeric grinding machine, provided by this project, needs minor preparation. It is learnt that some villagers might have mis-operated the machine and led to its disorder. Some marketing trainings should be added to the project activities to promote rural livelihood.

·With respect to project management, it is NOT recommendable to shift fund allotted for exchange study visit (Activity 10.1) to other activity like to Activity 5.1 and 5.2 of construction purposes, because one of the project objectives is to enhance the capacity and knowledge of staff, community and local government. The fund allotted for exchange visit will enhance the project staff's capacity and knowledge and thereby ensure the expected project outputs.

Annexes

Annex 1 Evaluation agenda
Annex 2 Project progress table
Annex 3 Project overall rating table
Annex 4 Reference documents
Annex 5 Survey questions & results for data collection
Annex 6 Lists of interviewees

Annex 1 Evaluation Agenda

No	Date	Activities
1	5 Nov 23	Moving to NPT from Yangon
2	6 Nov 23	Meeting with project coordinator at FRI, and site inspection at thematic zone of Bamboo, medicinal, arboretum
3	7 Nov 23	Site inspection of nature conservation zone, rare and endangered species zone, economy tree planting ozone and construction work of buggy lane, fire protection line
4	8 Nov 23	Interviewing Director General of the Forest Department at his office in NPT in the morning, and site inspection to precious timber tree garden zone and interviewing project staff
5	9 Nov 23	Site inspection to Leinli watershed demonstration practices, NPT-Leinli-NPT round trip. Visiting demonstration sites by boat, interviewing participating farmers, and visiting turmeric grinding house in the village.
6	10 Nov 23	Interviewing Project Director, and site inspection to 3 ha ornamental garden and wetland zone
7	13 Nov 23	Debriefing the project staff at the FRI
8	17-27 Nov	Writing MTE report and sending it to APFNet

Annex 2 Project Progress Table (against the project logical framework)

Items	Baseline (in line with PD/AWP)	Target (in line with PD/AWP)	Actual progress made (% completion of activities and degree of output/objective achievement)		Evaluator's brief comments
Output 1:		Construction Plan of FRI Arboretum formulated	%		
Activity 1.1	131 species occupied by 40 families were recorded.	Survey current conditions of FRI Arboretum	100	Completed	Based on the information obtained in the survey, choice of species can be decided. After the completion of the project, the same survey should be conducted so that to compare the difference of species and associated numbers.
Activity 1.2	No arboretum at FRI	Construction Plan of FRI Arboretum	100	Completed	Construction works are well done.
Activity 1.3		Evaluate and finalize "construction Plan of FRI Arboretum	100	Completed	The plan is finalized and arboretum is completed

Output 2:		Forest germplasm resources introduction and breeding nursery constructed			
Activity 2.1	50,000 seedlings could be produced	Upgrading and reconstruction of nursery, include construction of seedling bed, shading system, irrigation system and fence	100	Completed	Nursery is renovated and total amount of 100,000 seedlings can be raised at a time now.
Activity 2.2	131 species recorded	Forest germplasm resources collection	100	Completed	50 different plants species have been collected
Activity 2.3	Seedlings are annually produced at FRI.	Seedling raising	100		5000 seedlings covering 50 different species raised and distributed to community and participating farmers
Output.3		9ha native forest ecological conservation zone established			
Activity 3.1	Some gaps in ecological zone	Demonstration of enrichment planting of key species	80	Planting seedlings completed	600 seedlings of teak, Pyinkado and Tamalan have been planted. The planted species are in good growth.

Activity 3.2	Already existing planted zone with some gaps in the zones	Maintenance of the forest ecological conservation zone	80	Completed	Follow up activities in progress
Activity 3.3					
Output 4.		16ha thematic gardens (plantation and exhibition zone) established			
.Activity 4.1	No bamboo zone in FRI, some bamboos in medicinal zone only.	3 ha bamboo zone	80	Bamboo zone established	73% survival, replanting and fire prevention is in progress
Activity 4.2	No ornamental species zone	3 ha ornamental garden zone	80	Ornamental garden established	A garden with a pond is established, 50 different species and 675 seedlings were planted. More collection on species and seedling production are needed.
Activity 4.3	Medicinal garden is already existed	2 ha medicinal plant garden zone	80	Medicinal garden with new species observed	Medicinal garden renovated with new species. About 80 species have been collected in the garden. Some species needs special care for good growth.

Activity 4.4`	No zone assigned as rare and endangered species existed in FRI	2 ha rare and endangered species zone	80	Endangered species garden established	700 seedlings covering 38 different species planted. 76 % species collection and 78% for seedling planting completed
Activity 4.5	No specific fruit zone in FRI	2 ha fruit tree zone	80	2ha fruit tree zone has been established	50% percentage for species selection, 69% for seedling planting completed, maintenance is required.
Activity 4.6	Some precious trees like teak in FRI compound	2ha precious timber tree zone	80	Precious timber zone is established	46% of species collection and 28 % for seedling planting completed. Some new precious trees of mahogany, etc., are observed in timber zone in good growth status.
Activity 4.7	Normal pond with grass inside it	2ha wetland zone	100	Wetland zone established	Concrete works around the pond and trees grown on the circled-bank are observed
Output 5		Accessory facilities for arboretum constructed			
Activity 5.1	No arboretum	Construction of arboretum entrance completed	100	Arboretum entrance completed	Good design of arboretum entrance and greenhouses observed
Activity 5.2	No buggy road	Construction of 3812 m road/trail system	100	Trai road/buggy	Buggy road constructed and it connects thematic zones

				road completed	
Activity 5.3	Old irrigation system connecting to nursery only	Construction of 1982 m irrigation system	100	Irrigation system established	Networking water pipe line through the planting zones observed
Activity 5.4		Establishment of tree identification system	50	Tree identification in progress	EA is implementing the activity and it is in progress
Activity 5.5	Fire line in some place only	Construction of 3650 m forest fire control line	100	Fire control line established	Fire line is completed, regular cleaning the line is required, summer in particular
Output 6.		Integrated watershed management plan formulated			
Activity 6.1	The main objective is to evaluate the livelihood status of Leinli village and its dependency on nearby forestland and forest resources. Family size at 3-5 persons, 50% of family own land legally. 100% forest	Baseline investigation include social economic situation, threats for forest degradation	100	The investigation is completed	The survey was conducted in late February to early March 2020 by FRI staff. The same survey should be conducted so that to compare the difference between before and after project implmentation.

	dependent society. Turmeric is major crop for the families, and annual income is less than 5,000,000 kyats. Villagers prefer reforestation through agro-forestry practice. Shifting cultivation is major cause for deforestation. Teak, Yemane and Padauk trees are supported to grow by farmers.				
Activity 6.2	The major objective of this consultancy work is to develop a work plan for the establishment of agroforestry demon-stration plot for 100 acres with the participation of Lein li villagers in Paung long watershed management area. Farm land size is too small (<1 acre) to produce mass scale crops. Income from livestock raring is very minimal.	Development of participatory integrated water-shed co-management plan	100	The participatory integrated watershed co-management plan has been developed	Demonstration watershed management practices are done in accordance with the plan

	Deforestation is happening. Non- Timber Forest pro-ducts are major income for landless villagers. Farmers are interested in attending on training, bamboo-based handicraft training, home busi -ness training, com-post making training and forest nursery training. Value-added products by using local raw materials should be emphasized for live-lihood promotion.				
Output 7.		Integrated watershed management plan formulated	100		
Activity 7.1	A local forest nursery at Leinli forest area	Seedlings preparation for integrated watershed management practices	100	Seedlings of tree species and food crops were raised	Tree species and food crops species are observed in the demonstration plots

Activity 7.2	Degraded shifting cultivation area	Land preparation of demonstration site	100	Land preparation for tree planting is completed	Trees in good growth observed
Activity 7.3	Local variety of food crops at home garden in the village	Demonstration establishment of fruit tree	75	Fruit trees planting completed	43 ha has been established by planting of jackfruits, Danyin (Parkia speciosa), mango trees in demonstration sites. Some dead plants to be replanted in coming rainy season.
Activity 7.4	Degraded shifting cultivation field	Demonstration establishment of timber tree	100	Timber tree planting completed	42 ha has been planted with Padauk, Pyinkado, bamboos trees in demonstration plots
Activity 7.5		Maintenance & monitoring of demonstration sites of integrated watershed management practice	70	Maintenance for the demonstration sites in progress	Maintenance for the demonstration is organized and well done
Output 8.		An integrated forest management technology assembled and a technical handbook formulated	10	The work is in progress	Information collection for handbook is in progress

Activity 8.1		Summarizing technologies and experience of integrated watershed management practices		Work in progress	Work in progress
Activity 8.2	No technical handbook published by FRI	Development of technical handbook on integrated watershed management			Will be implemented in Year 5
Output 9	No technological handbook on integrated forest management by FRI	An integrated forest management technology assembled and a technical handbook formulated			
Activity 9.1		Training for young researchers on integrated forest management technology and rehabilita-1tion of degraded forest	80	Some trainings have been held	One training on integrated watershed management was conducted
Activity 9.2		Training course for local officials and local leaders on integrated forest watershed management	80	The training courses are done and some are to be held in year 4	One training on integrated forest watershed management was conducted inviting 25 trainees at FRI

Activity 9.3		Training course for local farmers on tree seedling raising, planting, agro-forestry, organic farming, maintenance of fruit orchard and tree plantation, fruit processing and marketing	80	Maintenance works for established fruit orchards and tree planting is in progress	Four trainings have been conducted for local farmers.
Activity 9.4		Formulation of a training manual	-	Will be implemented in year 5	This training will be implemented in year 5

Annex 3 Project overall rating table

Items	**Overall Rating**[1]
Goal: The main goal of this project is to conserve forest germplasm resources and to rehabilitate forest ecological services and forest productivity through establishment of arboretum and implementing integrated watershed forest management in Palaung watershed area	
Objectives: (1) To conserve and improve forest germplasm resources though construction of Arboretum in FRI; (2) To demonstrate integrated watershed management practice in Paung Luang Watershed; (3) To enhance the capacity and knowledge of local community, local government and staff through capacity building programs.	
Output 1: Construction Plan of FRI Arboretum" formulated	
• Activity 1.1 Survey on current condition of FRI arboretum	Satisfactory
• Activity 1.2 Development of "Construction Plan of FRI Arboretum	Satisfactory
• Activity 1.3 Evaluation and finalization of "Construction Plan of FRI Arboretum	Satisfactory
• **Output 2:** Forest germplasm re-sources introduction and breeding nursery constructed	Satisfactory
• Activity 2.1 Upgrading and reconstruction of nursery, include construction of seedling bed, shading system, irrigation system and fence.	Satisfactory

[1] OVERALL Ratings are provided based on the six-point ratings scale: Excellent (100), Satisfactory (80), Moderate (60), Unsatisfactory (40), Poor (20) and Not applicable (0).

• Activity 2.2 Forest germplasm resources collection	Satisfactory
• Activity 2.3 Seedling raising	Moderate
• **Output 3:** 9 ha native forest ecological conservation zone established	Moderate
• Activity 3.1 Demonstration of enrichment planting of key species	Satisfactory
Activity 3.2 Maintenance of the forest ecological conservation zone	Moderate
Output: 4.16ha thematic gardens (plantation and exhibition zone) established	Satisfactory
Activity 4.1: 3 ha bamboo zone	Moderate
Activity 4.2: 3 ha ornamental garden zone	Moderate
Activity 4.3: 2 ha medicinal plant garden zone	Moderate
• Activity 4.4: 2 ha rare and endangered species zone	Moderate
Activity 4.5: 2 ha fruit tree zone	Moderate
Activity 4.6: 2ha precious timber tree zone	Moderate
• Activity 4.7: 2ha wetland zone	Satisfactory
• **Output 5: Accessory facilities for arboretum constructed**	
• Activity 5.1: Construction of arboretum entrance completed	Satisfactory
• Activity 5.2: Construction of 3812 m road/trail system	Satisfactory
• Activity 5.3: Construction of 1982 m irrigation system	Satisfactory
• Activity 5.4: Establishment of tree identification system	In progress
• **Output 6:** Integrated watershed management plan formulated	
• Activity 6.1: Baseline investigation include social economic situation, threats for forest degradation	Satisfactory
• Activity 6.2: Development of participatory integrated water-shed co-management plan	Satisfactory
Output 7: Integrated watershed management plan formulated	

• Activity 7.1: Seedlings preparation for integrated watershed management practices	Satisfactory
• Activity 7.2: Land preparation of demonstration site	Satisfactory
• Activity 7.3: Demonstration establishment of fruit tree	Moderate
• Activity 7.4: Demonstration establishment of timber tree	Satisfactory
• Activity 7.51: Maintenance & monitoring of demonstration sites of integrated watershed management practice	Moderate
Output 8: An integrated forest management technology assembled and a technical handbook formulated	
• Activity 8.1: Summarizing technologies and experience of integrated watershed management practices	In progress
• Activity 8.2: Development of technical handbook on integrated watershed management	In progress
Output 9: An integrated forest management technology assembled and a technical handbook formulated	In progress
• Activity 9.1: Training for young researchers on integrated forest management technology and rehabilita-1tion of degraded forest	Moderate
• Activity 9.2: Training course for local officials and local leaders on integrated forest watershed management	Moderate
• Activity 9.3: Training course for local farmers on tree seedling raising planting, agroforestry, organic farming, maintenance of fruit orchard and tree plantation, fruit processing and marketing	Moderate
• Activity 9.4: Formulation of a training manual	

Annex 4 Reference Documents

No	Title
1	APFNet guidelines for Project Monitoring and Evaluation
2	Audited Report for the year 2019-2020
3	Audited Report for the year 2020-2021
4	Audited Report for the year 2020-2021
5	Project Document
6	Annual Project Progress Reports Year 1, 2 and 3 and appendixes
7	Training report on Tree Seed Technology and Nursery Practices, July 2021
8	Standard Nomenclature of Forest Plants, Burma, FD, Forest Research and Training Circle, 1962
9	Consultation report on virtual Meeting on Arboretum Landscape Design Plan for Forest Research Institute 21-9-2020
10	Project brochures, record on event

Annex 5. Survey questions & results for data collection

No	To whom	Questions	Answer/Result
1	Dr Thoung Naing Oo, DG, Forest Department-FD	How to make project intervention sustainable?	As the project is mainly located in FRI compound, it is easy for follow up operations to carry out, and the FD will take care of the activities by adding some fund to normal budget.
	Dr Thoung Naing Oo, DG, FD	Ditto	We will try to change from arboretum to urban forestry, and duplications of this project is thought for implementing in Shan, Yangon regions.
	Dr Thoung Naing Oo, DG, FD	Suggestions to project	Project fund should be received in time. Except some exceptionally difficulties, if happen, every possible activity will be done.
	Dr Thoung Naing Oo, DG, FD	How have you guided to overcome difficulties encountered?	Through media-virtual meeting, telephone conversation and change of command, the difficulties during the pandemic disease and follow up civil unrests were resolved. Local farmers and leaders were invited to FRI and trainings were given at FRI.
	Dr Thoung Naing Oo, DG, FD	Your comments on project fund?	Project fund should receive on time.
2	Moe Zaw (Mr)Director FRI	Project Management	I supervised the day-to-day project activities with great care and personal inspection to demonstration sites as the demonstration site is within my easy reach.
	Moe Zaw (Mr)Director FRI	How did you overcome some challenges encountered in the implementation of this project?	Challenges encountered in project implementation have been resolved with the guidance of the DG of FD, and of PMT, PSC and our deep discussion meeting among the project implementation team members.
	Moe Zaw (Mr)Director FRI	Sustainability of activities implemented in the APFNet project	I will assign the activities to respected sections of FRI for taking care of the plants grown during the APFNet project. Entrance fees from arboretum, medicinal gardens, greenhouse, ornamental tree garden will be substantial once the project is accomplished. The fees thus collected will be used in the follow up activities of the gardens thus established.

	Moe Zaw (Mr)Director FRI	Duplicability and scaling up potential of the project	The design and working process of this project can be duplicated by others. It is quite potential. To scale up the project, well preparation regarding land preparation, assessment to micro climate of an area, selection of species (trees, perennial food crops, seasonal crops), fund security, trainings for trainers, identification of intended community organization should be seriously considered well before the project commencement.
3	Dr Ei Ei Swe Hlaing	As a coordinator, what is your view on project progress to date?	Though challenges were encountered during the period of implementation, most activities have been done.
	Dr Ei Ei Swe Hlaing	How to do follow up activities for project activities?	The DG of the FD had explained to explore possible fund source for follow up actions, and before that respective section of the FRI will take care of the plants in thematic zone.
	Dr Ei Ei Swe Hlaing	What are the most challenging issues in project implementation?	In the first year, exploration and transportation of medicinal, ornamental and rare and endangered plants from different areas of the economy to present site was the most challenging issue. The second challenge is project fund issue like budget estimate and revised budget is different in amount, a good explanation has to present to the higher authorities. Fund transition from APFNet should be on time and it will promote implementation more smoothly than now.
	Dr Ei Ei Swe Hlaing	How have you resolved it?	Some activities were done in advance so that to solve possible challenging issues, an example is preordering construction materials, exploring official sanction for some activities in advance, etc.,
	Dr Ei Ei Swe Hlaing	Duplication and scaling up the project in other areas?	Provided that prearrangements are well done, and identification of risk factors are thoroughly pointed out, the project activities shall be implemented well.
	Aye Tun (Mr), Village head and participating farmers (15 persons at the house of community mobilizer)	What have you earnt lessons by participating in this watershed management project?	1. We have known advanced agricultural and forestry crops planting techniques 2. We ell understood how to conserve soil by systematic planting trees,

	A total of 15 questions and associated answers are mentioned here.		perennial fruit trees, bamboo and seasonal crops. 3. We have realized the point that value-added products using our raw materials can promote our income.
	ditto	How do you think the impacts for soil conservation by tree planting in this project? Do you think your livelihood and income became higher than before participating in this project?	(Very good, better, No significant. The answer is better. By planting commercially important trees, perennial food crops and seasonal agricultural crops, we feel our life is more secured than ever before as we have now some assets (land and trees) of our own, and the assets are growing day by day (our incomes are increasing day by day) though significant immediate household income has yet risen to us
	ditto	How about marketing for your local products of turmeric and elephant foot yam?	Market price for elephant foot yam is truly unstable as there is price fluctuation basing on market demand. Market price of turmeric, however, is stable. But now we came to know that value-added turmeric (making powder by utilizing turmeric grinding machine provided by this project) fetches nearly double amount of income than selling raw form of turmeric. Similarly, price of fermented bamboo shoot is three times higher than that of raw bamboo shot. We are therefore eager to learn value added techniques by using our locally produced raw materials.
	ditto	How do you think choice of tree species to present planting site?	The choice of species like Padauk (Pterocarpus macrocarpus) and Pyinkado (Xylia xylocarpa) are fairly matched to present planting site of the project.
	ditto	How do you think the planting design applied in this project?	The present planting design- trees in uppermost hill areas, perennial fruit trees in the middle, seasonal crops in lower part of the areas, and bamboos at the bottom of the hills are quite understandable and it is accomplishable the work.
	ditto	How do you think the possible impacts of social, economic and	There will be fresh air from the trees we planted, micro-environment in the vicinity of our village will be better than

		environmental conservation once the present is over?	before and our livelihood will be promoted in a very near future for timber and bamboos.
	ditto	What are your ideas to keep the follow up activities for the plantations?	We will protect all the planted trees, perennial crops and seasonal crops at our utmost as the trees are their assets to promote our livelihood.
	ditto	How often have you conducted meeting for turmeric grinding and marketing business?	We have held meetings for 5 times in the past, and presented on the meeting were member villagers at about 19 individuals.
	ditto	What materials were supported by the project to the participating farmers?	One grinding machine with a power meter, a small building, and trainings for 4 times, 5,000 kilograms of turmeric seeds for 60 project farmers were provided by the project.
	ditto	How about the turmeric grinding machine at present?	At present the grinding machine is closed because the turmeric harvest is to be done in early January of 2024.
	ditto	What are challenges in turmeric business?	The big challenge is, "marketing"
	ditto	Do you think it will be alright provided that such kind of project is implemented in the watershed of other different areas?	The good reputation of tree planting is spreading to other villagers like Lone Khe and Talaima villagers now, and a new project to those villages will surely be successful.
	ditto	How about the non-participating farmers view against the project activities? .	Some farmers/villagers are much interested in this project, but the area of the project is limited up to 100 acres (40 hectares), and the villagers were unaccepted to the project.
	ditto	What is your view on the Paung laung dam once the project is over?	Fresh water in the dam will be available, and minimal soil erosion to the dam is focused mainly for tree plantings with appropriate trees species to the present sites are done, and for systematic tree planting design was applied.

Annex 6. List of Interviewees

	Name	Position	Where?	When?	Remarks
1	Dr Thoung Naing Oo	DG	DG Office	8th Nov 2023	
2	More Zaw (Mr)	FRI Director	Director's Office	10thNovember 2023	Overall
3	Dr Ei Ei Swe Hlaing	Project Coordinator	Project Office	7th November 2023	Overall
4	Aung Zaw Mor (Mr)	Assistant Researcher	Ditto	6th November 2023	Bamboos
5	Dr Mu Mu Aung	Ditto	Ditto	11th November 2023	Medicinal
6	Toe Naing (Mr)	Ranger	Ditto	7th November 2023	Nature conservation
7	Salaing Myo Myint Oo	Ditto	Ditto	7th November 2023	Rare &endangered species, Fruit tree
8	Aung Myo Thu (Mr)	Project Assistant	Ditto	6-10th November 2023	Wetland, Ornamental
9	Myint Than (Mr)	Turmeric *	Lein Li	9th Nov 2023	PPV
10	Aye Tun (Mr)	Village head	Ditto	9th Nov 2023	PPV
11	Tin Shwe (Mr)	CB	Ditto	9th Nov 2023	PPV
12	Kyaw Aye Gyi (Mr)	Participant	Ditto	9th Nov 2023	PPV
13	Aung Myint Kyi (Mr)	Participant	Ditto	9th Nov 2023	PPV
14	Ah Mar Sein (Ms)	Participant	Ditto	9th Nov 2023	PPV
15	Thet Naing Oo (Mr)	Participant	Ditto	9th Nov 2023	PPV
16	Kyaw Htay (Mr)	Participant	Ditto	9th Nov 2023	PPV
17	Thein Htike (Mr)	Participant	Ditto	9th Nov 2023	PPV
18	Htay Myint (Mr)	Participant	Ditto	9th Nov 2023	PPV
19	Swe Hlaing Tun (Mr)	Participant	Ditto	9th Nov 2023	PPV
20	Mg Htay (Mr)	Participant	Ditto	9th Nov 2023	PPV
21	San Htike Oo (Mr)	Participant	Ditto	9th Nov 2023	PPV
22	Hla Win (Mr)	Participant	Ditto	9th Nov 2023	PPV
23	Myo Myint Aung (Mr)	Participant	Ditto	9th Nov 2023	PPV

Note:* means Turmeric business leader, PPV means Project Participating Villagers and CB means Community Mobilizer